Syllabus for Programming in C++

Duration: 1 Month [5 days a week, 2 hours a day, total 40 hours]

Introduction to Object Oriented programming concepts, Introduction to C++,

Constants and variables, data types, reserved words in C++, Arrays,

Operators in C++, arithmetic, logic, relational, assignment operators, string operators etc. Examples of each type, operator precedence

Control statements in C++, if-else statement, nested-if, while statement, do-while, for –loop, switch statement, NULL statement

Input and output, cin and cout statements

Functions in C++, parameter declaration, inline function, function prototype, function call, and function definition, passing values to a function, function template, return statement, reusing function names (overloading), passing value by reference, Operator overloading, function overloading.

I/O Stream, constructors

Arrays in C++, Records, pointers, array prototype, array initialization, array declaration, new and delete operators , two dimensional arrays.

Pointers, addresses and pointers, storing addresses, using addresses, declaring pointers, references and pointers, array names as pointers, dynamic array allocation

Storage classes, scope of variables, scope resolution Operator, Arrays and pointers,

Commonly used stream manipulators,

Records as data structures, structure of a record, declaring a record, struct statement, initializing a record, accessing individual elements of a record

An array of records, examples of records, returning the structure.

Simple file input/output.

Concept of a class, class construction, class definition, class declaration section and class implementation section, constructor function, class members, data members or instance variables, member functions, public, private and protected variables, methods, class properties, inheritance, polymorphism, encapsulation etc. with examples, , granting access privileges to nonmember functions, friend functions.

Additional class capabilities, assignment operator, operator functions, operator functions as friends, copy constructors, pointers as class members, scope of a class, static members, this pointer, data type conversions, Conversion from built-in type to built-in type, Conversion from built-in type to user-defined type, Conversion from user-defined type to built-in type, Conversion from user-defined type to user-defined type.

Inheritance, Derived and base class, Protected members, Overriding functions, Private, public, protected inheritance, Derived class constructors, Levels of inheritance and multiple inheritance.

Virtual functions and Polymorphism, Pointers to derived class, Need for virtual functions, Pure virtual functions, Abstract class, Dynamic / Late binding.

ALGORITHMS AND PROGRAMMING IN C – 1

(a) Fundamentals of algorithms: Notion of an algorithm. Pseudo-code conventions like assignment statements and basic control structures.

(b) Algorithmic problems: Develop fundamental algorithms for (i) Exchange the values of two variables with and without temporary variable, (ii) Counting positive numbers from a set of integers, (iii) Summation of set of numbers, (iv) Reversing the digits of an integer, (v) Find smallest positive divisor of an integer other then 1, (vi) Find G.C.D. and L.C.M. of two as well as three positive integers, (vii) Generating prime numbers.

(c) Structure of C: Header and body, Use of comments, Compilation of a program.

(d) Data Concepts: Variables, Constants, data types like: int, float char, double and void. Qualifiers: short and long size qualifiers, signed and unsigned qualifiers. Declaring variables, Scope of the variables according to block, Hierarchy of data types.

(e) Data Input and Output functions: Formatted I/O: printf(), scanf(). Character I/O format: getch(), getche(), getchar(), getc(), gets(), putchar(), putc(), puts().

(f) Iterations: Control statements for decision making: (i) Branching: if statement, else.. if statement, switch statement. (ii) Looping: while loop, do.. while, for loop. (iii) Jump statements: break, continue and goto

(g) Arrays: (One and multidimensional), declaring array variables, initialization of arrays, accessing array elements.

(h) Strings: Declaring and initializing String variables, Character and string handling functions.

(i)Structure: Declaration of structure, reading and assignment of structure variables, Array of structures, arrays within structures, structures within structures

(j) Unions: Defining and working with union. (e)Storage classes: Automatic variables, External variables, Static variables, Register variables.

(k) Functions: Global and local variables, Function definition, return statement, Calling a function by value,

(l) Recursion: Definition, Recursion functions algorithms for factorial, Fibonacci sequence, Tower of Hanoi. Implement using C.

(m) Sorting Algorithms: Bubble, Selection, Insertion and Merge sort, Efficiency of algorithms, Implement using C.

(n)Pointers: Fundamentals, Pointer variables, Referencing and de-referencing, Pointer Arithmetic, Chain of pointers, Pointers and Arrays, Pointers and Strings, Array of Pointers, Pointers as function arguments, Functions returning pointers, Pointer to function, Pointer to structure, Pointers within structure.

(o) Dynamic Memory Allocation: malloc(), calloc(), realloc(), free() and sizeof operator. (c) File handling: Different types of files like text and binary, Different types of functioms:fopen(), fclose(), fgetc(), fputc(), fgets(), fputs(), fscanf(), fprintf(), getw(), putw(), fread(), fwrite(), fseek()

(p) Stacks: Definition, Array representation of stacks, Algorithms for basic operators to add and delete an element from the stack, Implement using C.

(q) Linear Link lists: Representation of link list in memory, Algorithms for traversing a link list, searching a particular node in a link list, insertion into link list (insertion at the beginning of a node, insertion after a given node), deletion from a link list. Implement using C.

(r) Queues: Representation of queue, Algorithm for insertion and deletion of an element in a queue, Implement using C.